IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: J.C. Ehrstrom et al.	Group Art Unit: 1742 Examiner: J.A. Morillo
Serial No.: 10/849,525	
Filed: May 20, 2004	
For: MANUFACTURING METHOD FOR FRICTION WELDED ALUMINUM ALLOY PARTS	

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, JC Ehrstrom, do hereby declare as follows:

1. I obtained a Ph.D. degree in Materials Science and Engineering from the Ecole des Mines de Paris, France, in 1990. Since then, I have worked in the aluminum industry for 17 years specializing in the development of aluminum alloys for the transportation market.

I am a named inventor of the above-identified patent application ("the present application").

I am also familiar with US patent number 6,780,525 (Litwinski), and US patent no. 4,861,391 (Rioja), both of which have been cited in connection with the present application.

2. The present application is directed to a method for manufacturing age hardenable aluminum alloy parts joined by friction stir welding, wherein solution heat treatment and quenching of the welded part is carried out. In this type of method, average grain size in

JCE

the weld and heat affected zones may be considerably increased during solution heat treatment due to the high amount of energy stored in these zones. A process of the present application includes a heat treatment (homogenizing and/or intermediate heating and/or treatment of partly finished product) before friction stir welding. The heat treatment of the present application has a duration that is at least two times longer than the normal homogenization or solution heat treatment duration for the same alloy.

3. The normal homogenization or solution heat treatment duration for aluminum alloys has been defined as the treatment duration t_1 at a temperature T leading to a specific melting peak energy defined by DSC less than 1 J/g. The temperature T is generally as close as possible to the "burning" temperature of the alloy. The "burning" temperature is typically referred to as the "Incipient melting temperature". The "burning" temperature corresponds to a temperature at which local melting occurs. For commercial aluminum products or semi-products, the burning temperature is generally never below about 400 °C. The energy needed to obtain the local melting at a "burning" temperature is the "specific melting energy". Homogenizing or solution heat-treating enable soluble phases dissolution. Once the soluble phases have dissolved, local melting becomes significantly reduced or is avoided altogether. Normal homogenization or solution heat treatment duration corresponds to the time needed for soluble phases dissolution. DSC is a tool commonly used in the industry to control the quality of phase dissolution and a specific melting peak energy defined by DSC less than 1 J/g is a typical criterion. . In a process of the present application, the duration of homogenizing and/or intermediate heating and/or treatment of a partly finished product is significantly increased in order to not only obtain phase dissolution, but also to obtain coalescence of dispersoids which were found to enable the formation of fine grains after solution heat treatment of the friction stir welding part.

4. Litwinski teaches solution heat treatment before and after friction stir welding. However, Litwinski does not teach a heat treatment (homogenizing and/or intermediate heating and/or treatment of partly finished product) before friction stir welding with a duration significantly longer than the normal homogenization or solution heat treatment

JCE

duration for the same alloy. To the contrary, in Figure 4B in column 7 lines 35 to 40, Litwinski teaches normal solution heat treatment duration. Indeed, t_1 from Figure 4Bis defined by Litwinski as a "a sufficient period of time to allow the β phase to dissolve". As explained above, it corresponds to normal solution heat treatment duration. Litwinski teaches another method to control grain size after friction stir welding and solution heat treating the welded part : to heat the friction stir weld tool prior to and during the forming step of the weld joint (column 4 lines 10 to 13).

5. Rioja mainly provides teaching about aging heat treatments. Aging enables controlled precipitation of the dissolved elements, and occurs at much lower temperatures than phase dissolution s; namely, precipitation hardening is generally not carried out above 250 °C. In the Rioja reference, DSC is used as a tool to characterize precipitates formed or dissolved during aging. DSC is not used as a tool to characterize specific melting energy. To me, as one of skill in the art, Roija simply provides no motivation whatsoever to employ DSC in conducting a a solution heat treatment of Litwinski at least twice as long than the normal solution heat treatment because Rioja is directed to aging treatments.

6. I further declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and may jeopardize the validity of the application or any patent issued thereon.

29 octobre 2007
Date

J.C Ehrstrom
Dr. JC Ehrstrom